# NISTTech

## High Spectral Purity Microwave Oscillator Design using an Air-Dielectric Cavity

**Small, low-noise oscillator sized for a variety of applications**

## Description

This invention is a microwave oscillator that is small, simple, and produces clear signals at a single frequency. The oscillator is about the size of a roll of 35 mm camera film and operates at high signal power (many watts) without noise penalty. The technique maintains such a stable frequency that it can overcome or compensate for self-generated noise produced by components such as amplifiers that sustain oscillation.

Microwave oscillators are used as reference or clock signals in many high-precision technologies. Through control of temperature and other variables, the oscillators produce a desired signal at one narrowly defined frequency while suppressing random, electronically induced "noise" generated by components. The NIST oscillator is a low cost, low power consuming design and uses an ultra-stiff ceramic manifold that supports a single frequency with either a vacuum or air as the insulating medium.

## Applications

- **Homeland security**
  Surveillance of radio traffic for anomalous signals.
- **Defense**
  High-resolution digital imaging radar on unmanned aircraft.
- **Consumer devices**
  Satellite television downlinks.

## Advantages

- **Small**
  About the size of a roll of 35 mm camera film (3mm x 5mm).
- **Simple design**
  Low cost, reliable and energy efficient.
- **Clear signals at a single frequency**
  Several-orders-of-magnitude reductions in various types of self-generated signal interference compared to typical commercial oscillators; with improved frequency stability.

## Abstract

A high spectral purity microwave oscillator is provided. The Oscillator uses an air-dielectric cavity and employs the known carrier-suppression technique. In one embodiment, the oscillator employs a high-Q cavity to self-sustain an oscillating signal formed by feeding back into its input a power-amplified output signal of the cavity in which residual phase noise in the amplifier stages is suppressed. A bandpass filter selects the cavity mode. Another embodiment suppresses the noise of a voltage-controlled oscillator whose frequency and power-amplified output interrogates the cavity mode.

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## Related Items

- Article: Small, Low-noise Oscillator May Help in Surveillance

## References

- U.S. Patent #7,075,378 issued 07-11-2006, expires 08/18/2024
- Docket: 03-003US

## Status of Availability

active patent and available for licensing

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